Remarks

Claims 1-20 remain in the application.

Applicants' invention is concerned with maintaining the electrolyte concentration in a low temperature electrolytic cell for production of aluminum from alumina dissolved in the electrolyte. In the higher temperature cells such as in the Hall-Heroult process, the cell operates with a solid crust or layer that covers the molten electrolyte and thus for the periodic additions of alumina to the cell, the crust must be broken. This has the problem that large quantities of emissions such as volatile fluorides are lost from the cell and are usually captured along with emissions from other cells in a bag house. However, each cell operates differently and gives off different amounts of volatiles. Make-up electrolyte is added to the cell based on an average, which is not satisfactory because the average can be too much for one cell and not enough for another. This can require frequent analysis of each cell to maintain the desired electrolyte concentration. Applicants' invention solves this problem by capturing volatile material on alumina as the alumina is fed to the cell on a continuous basis. It should be noted that Applicants' cell operates without a frozen crust, making it possible for the alumina to be added on a continuous basis. Thus, in Applicants' invention, the volatile material is returned to the cell that it came from. Applicants claim this invention with respect to a low temperature cell which operates without a frozen crust. Claim 1 of Applicants' invention is set forth below for convenience:

> 1. (Original) A method of maintaining concentration in a low temperature electrolytic cell used for the production of aluminum from alumina dissolved in a molten salt electrolyte contained in a cell free of frozen crust, the method comprising:
>
> (a) providing a molten salt electrolyte at a temperature less than 900°C;
>
> (b) providing a plurality of anodes and cathodes disposed in said electrolyte;
>
> (c) venting volatile material from said cell through a conduit;
>
> (d) adding alumina to said cell through said conduit;
>
> (e) capturing said volatile material on said alumina; and

(f) returning said captured volatile material to said electrolyte with said alumina thereby maintaining the concentration in said molten salt electrolyte.

Thus, it will be seen that in Applicants' invention, the volatile material is returned directly with the alumina feed to the cell from which it came. Thus, in Applicants' invention, the electrolyte concentration remains relatively constant.

In the Office Action, claims 1-9 and 11-20 were rejected under 35 U.S.C. §103(a) on the basis of Beck et al (U.S. Patent 5,284,562) in view of Wellwood et al. (U.S. Patent 5,718,873) as follows:

> Beck et al teach the invention substantially as claimed. Beck et al teach (see abstract, figure 6, col. 1, lines 17-60 and col. 11, line 12 to col. 12, line 26) a process for the production of aluminum from alumina dissolved in a molten salt electrolyte contained in a cell free of frozen crust comprising (a) providing a molten salt electrolyte at 660-800°C, (b) providing a plurality of anodes and cathodes disposed in the electrolyte (c) venting volatile material (to the atmosphere) and (d) adding alumina to the cell.
>
> Beck et al do not teach venting the volatile material through a conduit or adding the alumina through the conduit thereby capturing the volatile material on the alumina.
>
> Wellwood et al teach (see abstract, figure 2 and col. 3, lines 42-48) a method of venting a fluoride gas stream from an aluminum smelter through the same conduit as the alumina solid particulate feed thereby facilitating the absorption of the fluoride gas onto the alumina and recycling the fluoride gas with the alumina feed.
>
> Therefore, it would have been obvious to one of ordinary skill in the art to have added the countercurrent gas-solid contacting means of Wellwood et al in the process of Beck et al, thereby venting the volatile material through the same conduit as the alumina feed, because the contacting means of Wellwood et al provide for recycling of the fluoride gases, thus reducing losses in the process.

It is respectfully submitted that claims 1-9 and 11-20 are patentable over Beck taken singly or combined with Wellwood. Beck is concerned with:

> An oxidation resistant, non-consumable anode, for use in the electrolytic reduction of alumina to aluminum, has a composition comprising copper, nickel and iron. The anode is part of an electrolytic reduction cell comprising a vessel having an interior lined with metal which has the same composition as the anode. The electrolyte is

preferably comprised of a eutectic of AlF3 and either (a) NaF or (b) primarily NaF with some of the NaF replaced by an equivalent molar amount of KF or KF and LiF.

It is submitted that Applicants' invention is patentable over Beck for a first reason. That is, Applicants' invention requires in claim 1: "(c) venting volatile material from said cell through a conduit". Beck et al are ***silent*** with respect to venting volatile material from the cell through a conduit. Thus, for this first reason, Applicants' invention is not disclosed by Beck et al.

Applicants' invention requires in claim 1 adding alumina, as follows: "(d) adding alumina to said cell through said conduit". Thus, in Applicants' invention, alumina is added through the same conduit through which the volatiles are vented.

It is submitted that Beck et al are ***silent*** with respect to the step of adding alumina to the cell through the same conduit that volatiles are vented. Thus, for this second reason, Applicants' invention is patentable over Beck et al.

It is submitted that Applicants' invention is patentable over Beck et al for a third reason. Applicants' invention requires that the volatiles from the cell be captured on the alumina as it is added to the cell. This is step 1(e), which is as follows: "(e) capturing said volatile material on said alumina". Clearly, Beck et al are ***silent*** with respect to capturing the volatile material on the alumina, and thus for this third reason, Applicants' invention is patentable over Beck et al.

Applicants' invention requires in step 1(f) returning the volatile material to the electrolyte in the cell, as follows: "(f) returning said captured volatile material to said electrolyte with said alumina thereby maintaining the concentration in said molten salt electrolyte." Beck et al are ***silent*** with respect to returning the captured volatile material to the electrolyte to maintain the concentration in the molten salt electrolyte. Thus, for this fourth reason, Applicants' invention is patentable over Beck et al.

It is respectfully submitted that Applicants' invention is patentable over the combination of Beck et al and Wellwood et al. That is, it is submitted that Wellwood does not supply the steps missing in Beck et al. The Wellwood reference is concerned with minimizing the amount of alumina required to scrub fluoride removal from off-gases (see col. 1, lines 43-46).

Thus, Wellwood provides a process for contacting solid particulate material with a gas in a plurality of annular contacting zones. The plurality of contacting zones comprises two contacting zones where gas is supplied to a first contacting zone (col. 2, lines 54-67, col. 3, lines 1-2), as follows:

> Preferably, the plurality of contacting zones comprises two contacting zones and the process comprises supplying a gas to a first contacting zone, said gas being imparted with an upward and circumferential velocity in the first contacting zone, the gas contacting solid particulate material in the first contacting zone, removing an exhaust gas from the first contacting zone and recovering a treated solid particulate material from the first contacting zone, supplying the exhaust gas from the first contacting zone to a second contacting zone, the second contacting zone being located above the first contacting zone, the gas being imparted with an upward and circumferential velocity in the second contacting zone, the gas contacting solid particulate material in the second contacting zone, wherein solid particulate material is transferred from the second contacting zone to the first contacting zone.

However, Wellwood indicates merely that the "solid particulate material is extracted from the lowermost contacting zone". See col. 3, lines 13-16). There is no teaching of the steps of Applicants' invention noted above.

The U.S. Patent Office refers to col. 3, lines 42-48 of Wellwood, which notes as follows:

> The process of the present invention is particularly suitable for the removal of fluoride species, such as hydrogen fluoride, from gaseous streams by adsorption on alumina particles. In using the process of the present invention for the adsorption of hydrogen fluoride, the consumption of alumina is reduced because the fluoride loading on the alumina is increased.

It is respectfully submitted that ***this is not*** a teaching of Applicants' invention, even if combined with Beck. That is, there is no teaching in either reference, even if combined, of Applicants' invention of maintaining the concentration of the molten salt electrolyte by returning volatile material to the cell from which it originated.

As noted earlier, Applicants' invention is designed to ***maintain the concentration*** of the molten salt electrolyte in a low temperature electrolytic cell for

producing aluminum from alumina. It is respectfully submitted that Applicants' invention is patentable over Wellwood for a first reason. That is, Wellwood only discloses using the fluoride containing off-gas from an aluminum smelter as feed for the scrubber (see col. 6, lines 7-9). Wellwood further discloses that overflow alumina from the contacting zone passes down conduit 36 and is ***removed from the apparatus*** (see col. 6, lines 44-45). As noted, Wellwood is ***silent*** with respect to maintaining the electrolyte concentration. Thus, it is submitted that for this first reason, Applicants' invention is patentable over Wellwood taken singly or combined with Beck.

Applicants' invention is patentable over Wellwood taken singly or combined with Beck for a second reason. That is, Applicants' invention (claim 1(d)) requires adding alumina to the cell through the conduit which vents the volatile material from the cell. Wellwood is ***silent*** with respect to adding alumina to the cell. Thus, for this second reason, Applicants' invention is patentable over Wellwood taken singly or combined with Beck.

It is submitted that Applicants' invention is patentable over Wellwood for a third reason. Applicants' invention requires capturing the volatile material on the alumina as the alumina is added to the cell. Wellwood is ***silent*** with respect to capturing the volatile material on the alumina being fed to the cell.

Applicants' invention requires returning the captured volatile material to the electrolyte in the cell with alumina to maintain the concentration of the molten salt electrolyte. Clearly, both Beck and Wellwood are ***silent*** with respect to returning the volatile material with the alumina fed to the cell to maintain the electrolyte concentration. Thus, for this additional reason, Applicants' invention is patentable over Wellwood taken singly or in combination with Beck.

It is respectfully submitted that there is no basis for combining Beck and Wellwood except Applicants' application, and the use of Applicants' invention as a roadmap through the art is strictly forbidden. References must somehow teach that they can be combined to produce Applicants' invention within their four corners and ***without***

reconstruction based on Applicants' specification. This law is set forth, for example, in the CCPA case of In re Regal, 188 USPQ 136 (1975), where the Court states as follows:

> ***There must be some logical reason apparent from positive, concrete evidence of record that justifies combination of primary and secondary references***; the mere fact it is possible to find two isolated disclosures which might be combined in such a way to produce a new product does not necessarily render such production obvious ***unless the art also contains something to suggest the desirability of the proposed combination***. (Emphasis added.)

It is submitted that claims 2-20 are patentable over Beck and Wellwood for the reasons for the reasons set forth above. Claim 10 is patentable over the combination of Beck, Wellwood and Duruz because Duruz does not supply the parts missing in Beck and Wellwood.

In view of the above amendments and remarks, it will be noted that a sincere attempt has been made to place this application in condition for allowance. Therefore, reexamination and reconsideration are requested and allowance solicited at an early date.

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